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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/758,679	01/15/2004	Jeremy E. Dahl	005950-845	4958

23911 7590 08/06/2008

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EXAMINER	
VENCI, DAVID J	
ART UNIT	PAPER NUMBER
1641	

MAIL DATE	DELIVERY MODE
08/06/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/758,679	DAHL ET AL.	
	Examiner	Art Unit	
	David J. Venci	1641	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *April 23, 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *29-41* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *29-41* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on April 23, 2008, has been entered.

Claims 29-41 are pending and under examination.

Claim Rejections - 35 USC § 112 – first paragraph

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 41 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim contains subject matter not described in the specification in such a way as to reasonably convey to skilled persons that the inventors, at the time the application was filed, had possession of the claimed invention.

Specifically, Examiner was not able to find support in the specification for the following claimed subject matter recited in newly added claim 41:

1. a step of inserting nitrogen "into" a vacancy;

2. a step of inserting nitrogen "into" a pore;

3. a “pore” within a diamondoid lattice;

4. a step of inserting nitrogen into a “pore within a diamondoid lattice”;

5. a step a) providing step including both a “replacing” step and an “inserting” step;

Applicants are required to cancel new matter.

Claim Rejections - 35 USC § 112 – second paragraph

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 29-41 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 29, 36 and 38, the term "heterodiamondoid" is indefinite. The identity of one or more member structures belonging to the class "heterodiamondoid" is not clear. Specifically:

1. The specification definitions on page 3, lines 26-27 and page 15, lines 19-25 appear directed to naturally-occurring (*e.g.*, mall) diamonds (see *e.g.*, Pereira, E. Energy transfer processes in diamond, in PROPERTIES AND GROWTH OF DIAMOND, Ch. 7.3, pp. 233-234, Davies, G. Ed., INSPEC, the Institution of Electrical Engineers (1994), *noting* that nitrogen is the major impurity in most natural and many high-temperature, high-pressure synthetic diamonds);

2. The specification definitions on page 15, lines 35 to page 17, line 35, and Figure 5 appear directed to synthetic adamantane derivatives;

3. The specification definition on page 10, lines 22 to page 13, line 11 appears directed to "diamondoids" that simultaneously contain heteroatoms, yet are somehow superimposed onto an FCC lattice.

It is unclear which compound(s) disclosed in the specification are encompassed by the term "heterodiamondoid" or whether providing a "heterodiamondoid" requires one or more steps of "folding in" a heteroatom (see *e.g.*, specification page 3, lines 26-27: "[a] heteroatom is essentially an impurity atom

that has been 'folded into' the diamond lattice"; see *also*, claims 35 and 41, *noting* the claimed steps of adding nitrogen heteroatoms to pre-existing heterodiamondoids). Assuming claim 29 requires providing a "heterodiamondoid" via one or more steps of "folding in" a heteroatom, the identity of such a "folding" reaction resulting in a diamond lattice having an atom "folded into" the diamond lattice is not clear.

In claims 35 and 41, the purpose of performing "replacing" in the overall method of detecting a target analyte is not clear and appears extraneous. Whether Applicants' invention is "a method of monitoring heterodiamondoid synthesis" or "a method of monitoring a diamond doping process" or "a method of monitoring n-type semiconductor fabrication" is not clear.

In claim 41, the identity of one or more prepositional objects referenced by the prepositional phrase "with a nitrogen heteroatom" is not clear. Whether said prepositional phrase references "replacing" OR/XOR "the diamondoid lattice sites" is not clear.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 29-34 and 36-40 are rejected under 35 U.S.C. 102(b) as being anticipated by Bronstein & Voyta (US 5,032,381).

Bronstein & Voyta describe a method of detecting a target analyte comprising the steps:

a) providing a heterodiamondoid-containing probe (see col. 9, Formula II);

b) binding the heterodiamondoid-containing probe to the target analyte (see col. 10, lines 29-32, “adding the chemiluminescent compound to the extracellular fluid so that it penetrates the cell”) thereby defining a label;

c) exciting the biological label with energy (see col. 6, lines 40-45, “activating means[...] added to, the cells”; see *e.g.*, col. 8, line 6, “thorough mixing”; see *also*, col. 10, line 13, “hydrogen peroxide and an alkaline substance”; see *also*, col. 11, lines 65-66, “lysogenic chemical”; see *also*, col. 13, line 58, “addition of base”); and

d) detecting light emitted from the excited biological label (see col. 4, lines 63-65, "spontaneous emission[...] is measurable by relatively inexpensive instrument"; see *e.g.*, Fig. 2, collecting lens 29) (paraphrasing mine).

With respect to claims 30-33, Bronstein & Voyta describe heterodiamondoid compositions (see col. 9, Formula II) enthalpically decomposable by photonic, electronic, and chemical excitation (see Abstract, "thermally, chemically, electrochemically, photochemically or enzymatically decomposible chemiluminescent compounds").

With respect to claim 34, 37 and 38, Bronstein & Voyta describe exciting frictional contact between a cell membrane and a cell membrane-bound probe (see col. 8, lines 6-10, "mixing[...] cells[...] permits the maximal penetration[...] en route to cleavage") (paraphrasing mine), and subsequent contact with another target analyte "triggering means" (see col. 8, line 10).

With respect to claim 36, Bronstein & Voyta describe heterodiamondoid compositions (see col. 9, Formula II) apparently having band gaps corresponding to electronic states of constituents within the composition, as evidenced by Dunmur, D. & Toriyama, K., Optical Properties, in PHYSICAL PROPERTIES OF LIQUID CRYSTALS, Ch. 3, pp. 113-128, Demus, D., Goodby, J., Gray, G.W., Spiess, H.W. & Vill, V., Eds., Wiley-VCH Verlag GmbH (1999) (*noting* Dunmur's & Toriyama's description of apparent optical absorbance of crystalline compositions, in general, in Section 3.3).

With respect to claims 39 and 40, Bronstein & Voyta describe photomultiplier tube-based detectors (see col. 13, lines 16-17) and charge-coupled device-based detectors (see col. 14, lines 24-25).

Claims 29, 32, 33 and 36 are rejected under 35 U.S.C. 102(e) as being anticipated by Bronstein (US 6,514,717).

Bronstein describes a method of detecting a target analyte comprising the steps:

a) providing a heterodiamondoid-containing probe (see general dioxetane structure in col. 1, lines 35-40, wherein group T = "adamantyl" (*i.e.*, col. 2, lines 19-20));

b) binding the probe to the target analyte (see col. 10, lines 28-40, "treating the olefin with singlet oxygen ($^1O_2$) in the presence of light") thereby defining a label;

c) exciting the biological label with energy (see Abstract, "contacting the 1,2-dioxetane with an enzyme under conditions which cause the enzyme to cleave the enzyme-labile substituent from the dioxetane, thereby yielding a negatively charged oxygen anion bonded to the 1,2-dioxetane, which causes the 1,2-dioxetane to decompose"); and

d) detecting light emitted from the excited biological label (see Abstract, "chemiluminescence").

With respect to claims 32 and 33, Bronstein describes heterodiamondoid compositions (see general dioxetane structure in col. 1, lines 35-40, wherein group T = "adamantyl" (*i.e.*, col. 2, lines 19-20)) enthalpically decomposable by chemical excitation (see Abstract, "contacting the 1,2-dioxetane with an enzyme").

With respect to claim 36, Bronstein describes heterodiamondoid compositions (see general dioxetane structure in col. 1, lines 35-40, wherein group T = "adamantyl" (*i.e.*, col. 2, lines 19-20)) apparently having band gaps corresponding to electronic states of constituents within the composition, as evidenced by Dunmur, D. & Toriyama, K., Optical Properties, in PHYSICAL PROPERTIES OF LIQUID CRYSTALS, Ch. 3, pp. 113-128, Demus, D., Goodby, J., Gray, G.W., Spiess, H.W. & Vill, V., Eds., Wiley-VCH Verlag GmbH (1999) (*noting* Dunmur's & Toriyama's description of apparent optical absorbance of crystalline compositions, in general, in Section 3.3).

Claims 29-33, 36, 39 and 40 are rejected under 35 U.S.C. 102(e) as being anticipated by Raymond *et al*. (US 6,864,103).

Raymond *et al*. describe a method of detecting a target analyte comprising the steps:

a) providing a heterodiamondoid-containing probe (see col. 36, line 3, "Recognition Moieties" see *e.g.*, col. 37, line 25, "methenamine");

b) binding the probe to the target analyte (see col. 36, lines 4-5, "'recognition moieties'[…] interact with an analyte") (paraphrasing mine) thereby defining a label;

c) exciting the biological label with energy (see col. 27, line 55-57, "exciting the fluorophore with the appropriate wavelength of light"); and

d) detecting light emitted from the excited biological label (see col. 27, lines 55-57, "detecting the resulting fluorescence").

With respect to claims 30-33, Raymond *et al*. describe heterodiamondoid compositions (see col. 36, line 3, "Recognition Moieties" see *e.g.*, col. 37, line 25, "methenamine") enthalpically decomposable by photonic, electronic, and chemical excitation (see col. 10, lines 45-47).

With respect to claim 36, Raymond *et al*. describe heterodiamondoid compositions (see col. 36, line 3, "Recognition Moieties" see *e.g.*, col. 37, line 25, "methenamine") apparently having band gaps corresponding to electronic states of constituents within the composition, as evidenced by Dunmur, D. &

Toriyama, K., Optical Properties, in PHYSICAL PROPERTIES OF LIQUID CRYSTALS, Ch. 3, pp. 113-128, Demus, D., Goodby, J., Gray, G.W., Spiess, H.W. & Vill, V., Eds., Wiley-VCH Verlag GmbH (1999) (*noting* Dunmur's & Toriyama's description of apparent optical absorbance of crystalline compositions, in general, in Section 3.3).

With respect to claims 39 and 40, Raymond *et al*. describe photomultiplier- and charge-coupled device-based detectors (see col. 27, lines 58-59).

Claims 29-33 and 36 are rejected under 35 U.S.C. 102(b) as being anticipated by Kobashi (US 5,777,372).

Kobashi describes a method of detecting a target analyte comprising the steps:

a) providing a heterodiamondoid-containing probe (see Fig. 22, semiconducting diamond layer 87; see *also*, col. 10, lines 46-49, “doped with boron”);

b) binding the heterodiamondoid-containing probe to the target analyte (see Fig. 22, bioidentifier 85; see *e.g.*, Tables 1-3, “Identifying substance”) thereby defining a label;

c) exciting the biological label with energy (see col. 10, lines 14-17, “reaction between the bioidentifier and the chemical and bio-related substance in the sample”); and

d) detecting light emitted from the excited biological label (see col. 10, lines 14-17, “light can be detected by the diamond photodetector”).

With respect to claims 30-33, Kobashi describes heterodiamondoid compositions (see Fig. 22, semiconducting diamond layer 87; see *also*, col. 10, lines 46-49, “doped with boron”) enthalpically decomposable by photonic (see col. 10, lines 50-54, “illumination of light”), electronic (see col. 10, line 8, “injection of carriers (electron and hole) into diamond film"), and chemical excitation (see col. 10, lines 14-17, “reaction between the bioidentifier and the chemical and bio-related substance in the sample”).

Response to Arguments

Claim Rejections - 35 USC § 112 – second paragraph

In prior Office Action, claims 29, 36 and 38 were rejected under 35 U.S.C. 112, second paragraph, because the term "heterodiamondoid" is indefinite. The identity of one or more member structures belonging to the class "heterodiamondoid" is not clear.

In response, Applicants argue:

1. the specification page 15, lines 35 to page 17, line 35 provides an exemplary synthesis of heterodiamondoids and another patent specification provides additional information;

2. as explicitly defined in the specification, the term "heterodiamondoid" refers to:

    a. diamondoids having substitution or interstitial heteroatoms (specification page 15, lines 19-25);

    b. a diamondoid topology wherein Applicants superimpose diamondoid carbon atoms on a fragment of a FCC lattice (specification page 10, lines 22 to page 13, line 11).

Applicants' arguments have been carefully considered but are not persuasive.

With respect to 1), the specification's exemplary synthesis fails to disclose whether/which product(s) of the synthesis satisfy the specification's definitions of "diamondoid" or "heterodiamondoid" (see next paragraph). Specifically, the specification does not disclose whether any of the products simultaneously contain heteroatoms and are superimposed onto an FCC lattice. The specification does not disclose

crystal structures for any of the synthetic product(s) for purposes of determining whether the products simultaneously contain heteroatoms and are superimposed onto an FCC lattice. If the step of "providing a heterodiamondoid-containing probe" recited in claim 29 merely requires providing a synthetic nitrogen-substituted tetramantane derivative, claim 29 should clearly state so.

With respect to 2), the specification's divergent "heterodiamondoid" definitions are not helpful. Claim 29 requires performing a step of "providing a heterodiamondoid-containing probe". It is unclear which compound(s) disclosed in the specification are encompassed by the term "heterodiamondoid". Specifically:

1. The specification definitions on page 3, lines 26-27 and page 15, lines 19-25 appear directed to naturally-occurring (*e.g.*, mall) diamonds (see *e.g.*, Pereira, E. Energy transfer processes in diamond, in PROPERTIES AND GROWTH OF DIAMOND, Ch. 7.3, pp. 233-234, Davies, G. Ed., INSPEC, the Institution of Electrical Engineers (1994), *noting* that nitrogen is the major impurity in most natural and many high-temperature, high-pressure synthetic diamonds);

2. The specification definitions on page 15, lines 35 to page 17, line 35, and Figure 5 appear directed to synthetic adamantane derivatives;

3. The specification definition on page 10, lines 22 to page 13, line 11 appears directed to "diamondoids" that simultaneously contain heteroatoms, yet are somehow superimposed onto an FCC lattice.

In prior Office Action, claim 35 was rejected under 35 U.S.C. 112, second paragraph, as being indefinite because the structural cooperative relationship between "vacancy or pore" and other words was

considered essential. Upon reconsideration, and in view of Applicants' persuasive argumentation, these rejections are withdrawn.

Claim Rejections - 35 USC § 102

In prior Office Action, claims 29-34 and 36-40 were rejected under 35 U.S.C. 102(b) as being anticipated by Bronstein & Voyta (US 5,032,381). Claims 29, 32, 33 and 36 were rejected under 35 U.S.C. 102(e) as being anticipated by Bronstein (US 6,514,717). And, claims 29-33, 36, 39 and 40 were rejected under 35 U.S.C. 102(e) as being anticipated by Raymond *et al*. (US 6,864,103).

In response, Applicants argue that none of the cited prior art satisfies the specification definition(s) of "heterodiamondoid".

With respect to dependent claims 35 and 41, Applicants' arguments are persuasive because the cited prior art does not appear to teach the recited step of "replacing" resulting in a diamond compound having the structural details recited in dependent claims 35 or 41.

With respect to independent claim 29, the specification definition(s) of the term "heterodiamondoid" appears broad/ambiguous enough to allow anticipation by Bronstein & Voyta, Bronstein and Raymond *et al*. (see *supra*, *Claim Rejections - 35 USC § 112 – second paragraph*). According to the specification p. 15, lines 19-25, a heterodiamondoid "contains" a heteroatom. Similarly, Bronstein & Voyta, Bronstein and Raymond *et al*. disclose "heterodiamondoids" because each describe a diamond compound that "contains" a heteroatom. For example, Bronstein & Voyta disclose a diamond compound that "contains" phosphorous, while Bronstein discloses a diamond compound that "contains" oxygen, while Raymond *et al*. disclose a diamond compound that "contains" lanthanides.

In prior Office Action, claims 29-34 and 36-38 were rejected under 35 U.S.C. 103(a) as being unpatentable over Huang *et al*. (US 7,070,921) in view of Bronstein (US 6,514,717). In order to simplify matters, and in view of redundant claim rejections under 35 U.S.C. 102(e) in view of Bronstein (US 6,514,717), the rejection of claims 29-34 and 36-38 under 35 U.S.C. 103(a) is withdrawn.

Conclusion

Claims 35 and 41 are free of prior art.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David J. Venci whose telephone number is (571)272-2879. The examiner can normally be reached on 08:00 - 16:30 (EST). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long Le can be reached on 571-272-0823. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Mark L. Shibuya, Ph.D./
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